INTERMEDIATE SCALE COASTAL BEHAVIOUR: MEASUREMENT, MODELLING AND PREDICTION

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LONG-TERM GOAL

Our overall goal is to achieve a better understanding and better predictions of coastal behaviour at intermediate (event/season/year/decade) scales. We aim to bring together researchers from Europe and North America to gain the best possible benefit from developments in field observation, theory and numerical modelling.

SCIENTIFIC OBJECTIVES

We are following a four-pronged collaborative approach. Data on intermediate scale behaviour from both sides of the Atlantic are being studied and ways are being sought to project these observations onto a manageable number of descriptive parameters or basic patterns. Top-down modelling will use these data products to develop black-box (data extrapolation) and grey-box (behaviour-oriented) models for the observed behaviour. Bottom-up modelling will investigate the predictive potential of process-based models, making best use of process results from US and European field campaigns, combined with existing modelling expertise. There is also a vital linking activity aimed at ensuring that the data, top-down modelling and bottom-up modelling activities interact fully, in order to bring together the most productive aspects of each into a predictive capability for intermediate-scale coastal change.

APPROACH

This project is designed to create interaction between European and North American scientists who are already involved in research related to intermediate scale coastal behaviour. We have a four part approach to achieving this interaction. These are outlined below, and details of work acheived so far in each are in the following section.

A series of seven Workshops is planned over the lifetime of the project, with three expected to be held in Europe and four in the US.

Exchanges of key personnel between the US and Europe have already begun. We envisage exchange visits lasting anywhere from a few days to several months, to allow real collaboration in modelling, in fieldwork and in data analysis and interpretation. A major element in these exchanges is linking existing major projects in Europe funded through the EC MAST programme, such as COAST3D, INDIA, SASME, PACE, with related major programmes in North America, such as the current Sandy Duck field programme.

The project also provides for the partial funding of researchers at the four European centres (Plymouth, Wallingford (both UK), Twente (The Netherlands) and Lyngby (Denmark). These researchers will be central to the collaboration within this projct, and are expected to be the main beneficiaries of the proposed exchanges.

Finally the project also provides for some additional research support to ensure that best use is made of the field expertise within the project. Two new ARGUS stations are planned, for the two field sites of the EC-funded COAST3D project, and an existing ARGUS station in the UK (Perranporth) will be upgraded by the installation of an offshore pressure sensor array for tide and wave measurments.

WORK COMPLETED

This project nominally started on 1st May 1997 and has therefore been in existence for less than 6 months. Nevertheless a good start has been made on collaborative activities.

Planning for the first of our Workshops is well advanced. The title is "How can we assess skill and predictability of coastal morphological forecasts?" and it will be held at HR Wallingford, UK 17th-19th November 1997. Guest speakers will discuss measures of skill in oceanographic and meteological modelling, the current understanding of chaos and non-linear systems, and the use of Baysian statistics for improving predictions. Project participants will also give presentations, but more than half of the time will be devoted to discussions and workshop groups. The number of participants will be limited to ensure a genuine workshop interaction.

The first exchanges of researchers from Europe have begun. Visits to the SANDY DUCK experiment, some underway as this report is being written, include two from the University of Plymouth (Drs Paul Russell and Mark Davidson), one from ISVA, Denmark (PhD student Nils Droenen), two from Holland (Dr Piet Hoekstra, Utrecht University and Ad Reniers, Delft University and Delft Hydraulics) and one from HR Wallingford (Dr Richard Whitehouse). Nils Droenen also visited Dalhousie Unversity during his nearly three-week visit to North America. Richard Whitehouse also visted USACE, Vicksberg.

Ad Reniers is collaborating with Ed Thornton, of the Naval Postgraduate School, to test a quasi-3D nearshore dynamics model, describing vertical profiles of coupled cross-shore and longshore currents. The effects of breaking, wind stress and tides are included in the model. A cross-shore array of eight pressure sensors was used during SANDY DUCK to measure wave transformation and set up/down. A vertical array of electromagnetic current meters mounted on a mobile sled was used to measure vertical velocity profiles. Cross-shore transects of current profiles were obtained at least daily during a six week period comprising a variety of weather conditions. Comparisons with model results show reasonable agreement.

Appointment of partially funded researchers has also begun. At Plymouth a PhD student, Ken Kingston, started on 1st October and will be involved in the ARGUS systems at Perranporth and the new system to be installed at Teignmouth. At ISVA,

Denmark, Nils Droenen will be employed as Research Assistant in November and December 1997.

A site survey for the new ARGUS system in the UK has been conducted, and plans for installation will be finalised when Rob Holman comes to the UK for the Workshop next month. Following the Workshop Rob will also travel to Egmond to begin installation of the new ARGUS there. Equipment for the pressure sensor array at Perranporth is on order and under construction and deployment should occur before the end of the year.

RELATED PROJECTS

Since the start of this project several EC MAST projects involving the PI's have received final approval and have either started (COAST3D, SASME) or are expected to start next month (INDIA). The wide range of European projects envisaged in the proposal is therefore now a reality.

REFERENCES

The SASME project has a Web page at : http://www.wldelft.nl/sasme/sasme.htm